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10/767,107

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Ray R. Eshraghi

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12/12/2007

INTELLECTUAL PROPERTY / TECHNOLOGY LAW

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RESEARCH TRIANGLE PARK, NC 27709

EXAMINER

CHUO, TONY SHENG HSIANG

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

12/12/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|----------------------------------------|--|
| Office Action Summary | Application No. 10/767,107 | Applicant(s) ESHRAGHI ET AL. | |
| | Examiner Tony Chuo | Art Unit 1795 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14, 16-39, 41-47, 49 and 50 is/are pending in the application.
- 4a) Of the above claim(s) 2-9, 11-14, 26, 31-39 and 41-47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 10, 16-25, 27-30, 49 and 50 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-14, 16-39, 41-47, 49, and 50 are currently pending. Claims 15, 40, and 48 are cancelled. Claims 2-9, 11-14, 26, 31-39, and 41-47 are withdrawn from further consideration as being drawn to a non-elected invention. The applicant is reminded that the current amendment filed on 10/5/07 includes amendments to claims 1 and 18 that were filed on 3/15/04. The current amendment does not include the limitations from the most recently filed amendment that was filed on 1/17/07. For purpose of compact prosecution, the most recently filed amendments to the claims 1 and 18 are construed as being deleted. The current amended claims do overcome the previously stated 102 rejection. However, the amended claims do not overcome the previously stated 103 rejections. Therefore, upon further consideration, claims 1, 10, 16-25, 27-30, 49, and 50 stand rejected under the following 103 rejections.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 10, 16-20, 22-25, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amendola et al (US 6534033) in view of Kuespert (US 6228146).

The Amendola reference discloses a hydrogen generation system "100" comprising: a reservoir "120" for containment of a NaBH_4 solution "140" that is adapted to hold a volume of NaBH_4 solution in isolation from an exterior environment of the reservoir and a reaction chamber "180" having a hydrogen generation catalyst system "170" (See column 13 line 62 to column 14 line 3 and Figure 9). It also discloses a NaBH_4 solution that has a concentration ranging from 5 to 25 wt% NaBH_4 and 1 to 10 wt% NaOH (See Figure 1). It also discloses water generated from a hydrogen consuming device such as a fuel cell that is added to the borohydride solution (See column 4, lines 30-48). It also discloses an inlet "200" for the NaBH_4 solution and an outlet "160" for the NaBH_4 solution (See Figure 9).

However, Amendola et al does not expressly teach a plurality of microtubular elements disposed in the housing, wherein each of the microtubular elements comprises a tubular wall permeable to a target gas and defining a bore side and a shell side, and wherein the bore side of each of the microtubular elements is sealed from the shell side thereof; and a carrier material for storing the target gas, wherein the carrier material is disposed in and stored in the housing in isolation from the exterior environment of the housing and at either the bore sides or the shell sides of the microtubular elements; carrier material for the target gas that is disposed at the shell sides of the microtubular elements; microtubular elements that are potted at one or

more potted members so that the bore sides of the microtubular elements are sealed from the shell sides thereof by the one or more potting members in a leak-tight manner, wherein one or more potting members and the housing define: at least one liquid compartment for holding the liquid carrier material and at least one hydrogen collection compartment separated from the liquid compartment in a leak-tight manner, wherein the microtubular elements extend from the liquid compartment to the hydrogen collection compartment, so that the shell sides of the microtubular elements at least partially contact the liquid carrier material in the liquid compartment, and that the bore sides of the microtubular elements are in fluid communication with the hydrogen collection compartment, and wherein the housing comprises at least one hydrogen outlet connected to the hydrogen collection compartment for dispensing hydrogen gas therefrom; and tubular walls of the microtubular elements that comprise a membrane material that is gas-permeable but liquid-impermeable, wherein the membrane material comprises a microporous, hydrophobic polymeric material.

The Kuespert reference discloses a gas recovery device "10" comprising: a) a shell "22" comprising a gas collection compartment "26" and a gas storage compartment (not labeled); b) a plurality of permeation units "30" that are tubular elements disposed in the shell i) having one or more open ends in fluid communication with the gas collection compartment and ii) extending from the gas collection compartment into the gas storage compartment, wherein each of the permeation unit comprises a tubular wall permeable to a target gas and defining a bore side and a shell side; c) an epoxy resin which together with the tubular walls, sealingly isolates the gas collection compartment

from the gas storage compartment by potting the ends of tubes "30"; and d) a carrier material is disposed in the gas storage compartment on the shell side of the permeation units (See column 4, lines 5-36 and Figure 2). It also discloses permeation units that are gas permeable, liquid impermeable tubes of expanded microporous polytetrafluoroethylene that has outer diameters of about 3 mm (See column 6, lines 58-66).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola hydrogen generation system to include a plurality of microtubular elements disposed in the housing, wherein each of the microtubular elements comprises a tubular wall permeable to a target gas and defining a bore side and a shell side, and wherein the bore side of each of the microtubular elements is sealed from the shell side thereof; and a carrier material for storing the target gas, wherein the carrier material is disposed in and stored in the housing in isolation from the exterior environment of the housing and at either the bore sides or the shell sides of the microtubular elements; carrier material for the target gas that is disposed at the shell sides of the microtubular elements; microtubular elements that are potted at one or more potted members so that the bore sides of the microtubular elements are sealed from the shell sides thereof by the one or more potting members in a leak-tight manner, wherein one or more potting members and the housing define: at least one liquid compartment for holding the liquid carrier material and at least one hydrogen collection compartment separated from the liquid compartment in a leak-tight manner, wherein the microtubular elements extend from the

liquid compartment to the hydrogen collection compartment, so that the shell sides of the microtubular elements at least partially contact the liquid carrier material in the liquid compartment, and that the bore sides of the microtubular elements are in fluid communication with the hydrogen collection compartment, and wherein the housing comprises at least one hydrogen outlet connected to the hydrogen collection compartment for dispensing hydrogen gas therefrom; and tubular walls of the microtubular elements that comprise a membrane material that is gas-permeable but liquid-impermeable, wherein the membrane material comprises a microporous, hydrophobic polymeric material in order to facilitate the separation of a gas from a liquid carrier material by integrating a plurality of permeation units into the housing of the hydrogen generation system.

Examiner's note: The Kuespert reference is relevant to the Amendola reference and the applicant's field of endeavor because it solve the same problem of separating gas from a liquid carrier material.

4. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amendola et al (US 6534033) in view of Kuespert (US 6228146) as applied to claims 1, 10, and 16-18 above, and further in view of Henis et al (US 4230463).

However, Amendola et al as modified by Kuespert does not expressly teach tubular walls of the microtubular elements that comprises a first layer of structural material that is gas and liquid permeable and a second layer that is gas permeable but liquid impermeable. The Henis reference discloses a multicomponent gas separation

membrane comprises a first layer "2" that is gas and liquid permeable and a second layer "1" that is gas permeable but liquid impermeable (See Figure 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola/Kuespert hydrogen generation system to include tubular walls of the microtubular elements that comprises a first layer of structural material that is gas and liquid permeable and a second layer that is gas permeable but liquid impermeable in order to utilize a membrane that provides high structural strength, toughness, and abrasion and chemical resistances, yet exhibits commercially advantageous flux and selective separation (See column 6 line 66 to column 7 line 2).

5. Claims 29, 30, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amendola et al (US 6534033) in view of Kuespert (US 6228146) as applied to claims 1, 10, 16-18, and 22 above, and further in view of Hockaday et al (US 2001/0045364). In addition, Kuespert also discloses gas permeable membranes of microporous substrates of a first gas permeable polymer coated with a second gas permeable polymer (See column 6, lines 52-55).

However, Amendola et al as modified by Kuespert does not expressly teach each of the tubular walls of the microtubular elements that comprises a first layer of a catalyst material, a second layer of a membrane material that is gas permeable but liquid impermeable, and third layer of structural material that is gas and liquid permeable; or tubular wall of each microtubular element that is impregnated with a catalyst material and has a coating of a membrane material that is gas permeable but liquid impermeable

on an inner surface. The Hockaday reference discloses production of hydrogen that is initiated by a catalyst coated surface "5" that is attached to a hydrophobic porous membrane "1" (See paragraph [0098]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola/Kuespert hydrogen generation system to include each of the tubular walls of the microtubular elements that comprises a first layer of a catalyst material, a second layer of a membrane material that is gas permeable but liquid impermeable, and third layer of structural material that is gas and liquid permeable; or tubular wall of each microtubular element that is impregnated with a catalyst material and has a coating of a membrane material that is gas permeable but liquid impermeable on an inner surface in order to utilize a catalytic surface to more efficiently deliver a controlled hydrogen stream to portable applications.

Response to Arguments

6. Applicant's arguments filed 10/5/07 have been fully considered but they are not persuasive.

The applicant argues that there is no reason that one would seek to employ the permeation tubes of Kuespert in Amendola, since the fundamental purpose of Amendola would be frustrated. The applicant also argues that any flow restriction or impedance would defeat the objective of Amendola to release the hydrogen gas freely from the liquid. The applicant further argues that placing permeation tubes from Kuespert into the reservoir of Amendola would reduce the efficiency of gas separation

from the liquid carrier material, since Amendola generates hydrogen, which then simply bubbles to the surface of the borohydride solution and is released immediately to the head space in the reservoir. Finally, the applicant argues that importing the permeation tubes of Kuespert would not allow the liquid level in the legs of the U-shaped reservoir to freely adjust in relation to one another, as is taught to be necessary by Amendola to achieve a self-regulating hydrogen generator.

The examiner would like to respond by stating that the arguments regarding the Amendola's use of a U-shaped manometric-type reservoir is an incorrect assessment of the Amendola reference. The applicant is relying on the embodiment shown in Figures 8A and 8B of the Amendola reference to show that modifying the Amendola U-shaped reservoir with the permeation tubes of the Kuespert reference would destroy the fundamental purpose of the Amendola reservoir. However, as clearly stated in the previous office action, the examiner is relying on the embodiment shown in Figure 9 of the Amendola reference which does not have the U-shaped reservoir. Therefore, the examiner maintains the assertion that the Amendola reservoir can be modified by the Kuespert permeation tubes without destroying the fundamental purpose of Amendola reservoir.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC


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PRIMARY EXAMINER